

## CMOS 8-Bit Addressable Latch

High-Voltage Types (20-Volt Rating)

■ CD4099B 8-bit addressable latch is a serial-input, parallel-output storage register that can perform a variety of functions.

Data are inputted to a particular bit in the latch when that bit is addressed (by means of inputs A0, A1, A2) and when WRITE DISABLE is at a low level. When WRITE DISABLE is high, data entry is inhibited; however, all 8 outputs can be continuously read independent of WRITE DISABLE and address inputs.

A master RESET input is available, which resets all bits to a logic "0" level when RESET and WRITE DISABLE are at a high level. When RESET is at a high level, and WRITE DISABLE is at a low level, the latch acts as a 1-of-8 demultiplexer; the bit that is addressed has an active output which follows the data input, while all unaddressed bits are held to a logic "0" level.

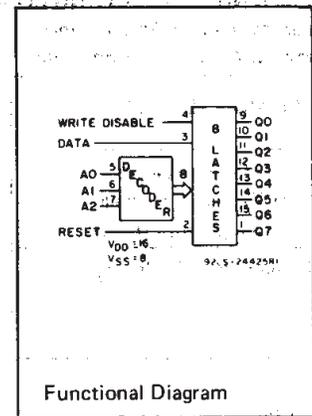
The CD4099B types are supplied in 16-lead hermetic ceramic dual-in-line packages (F3A suffix), 16-lead plastic dual-in-line packages (E suffix), 16-lead small-outline packages (M, M96, MT, and NSR suffixes), and 16-lead thin shrink small-outline packages (PW and PWR suffixes).

### Features:

- Serial data input
- Active parallel output
- Storage register capability
- Master clear
- Can function as demultiplexer
- Standardized, symmetrical output characteristics
- 100% tested for quiescent current at 20 V
- Maximum input current of 1  $\mu$ A at 18 V (full package-temperature range), 100 nA at 18 V and 25°C
- Noise margin (full package-temperature range) = 1 V at  $V_{DD} = 5$  V, 2 V at  $V_{DD} = 10$  V, 2.5 V at  $V_{DD} = 15$  V
- 5-V, 10-V, and 15-V parametric ratings
- Meets all requirements of JEDEC Tentative Standard No. 13B, "Standard Specifications for Description of 'B' Series CMOS Devices"

### MAXIMUM RATINGS, Absolute-Maximum Values:

|  |  |
|--|--|
| DC SUPPLY-VOLTAGE RANGE, ( $V_{DD}$ )                                      | -0.5V to +20V                                      |
| Voltages referenced to $V_{SS}$ Terminal                                   |  |
| INPUT VOLTAGE RANGE, ALL INPUTS  | -0.5V to $V_{DD} + 0.5$ V                          |
| DC POWER CURRENT, ANY ONE INPUT  | $\pm 10$ mA  |
| POWER DISSIPATION PER PACKAGE ( $P_D$ ):                                   |  |
| For $T_A = -55^\circ\text{C}$ to $+100^\circ\text{C}$                      | 500mW  |
| For $T_A = +100^\circ\text{C}$ to $+125^\circ\text{C}$                     | Derate Linearly at 12mW/ $^\circ\text{C}$ to 200mW |
| DEVICE DISSIPATION PER OUTPUT TRANSISTOR                                   |  |
| FOR $T_A =$ FULL PACKAGE-TEMPERATURE RANGE (All Package Types)             | 100mW  |
| OPERATING-TEMPERATURE RANGE ( $T_A$ )                                      | $-55^\circ\text{C}$ to $+125^\circ\text{C}$        |
| STORAGE TEMPERATURE RANGE ( $T_{stg}$ )                                    | $-65^\circ\text{C}$ to $+150^\circ\text{C}$        |
| LEAD TEMPERATURE (DURING SOLDERING):                                       |  |
| At distance 1/16 $\pm$ 1/32 inch (1.59 $\pm$ 0.79mm) from case for 10s max | $+265^\circ\text{C}$                               |



Functional Diagram

### Applications:

- Multi-line decoders
- A/D converters

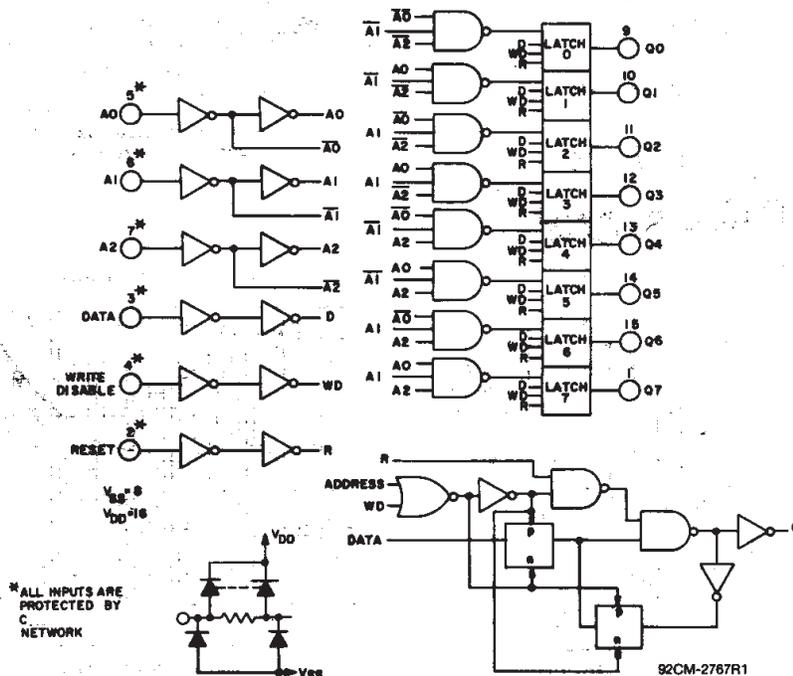
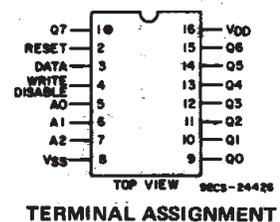


Fig. 1 - Logic diagram of CD4099B and detail of 1 of 8 latches.



TERMINAL ASSIGNMENT

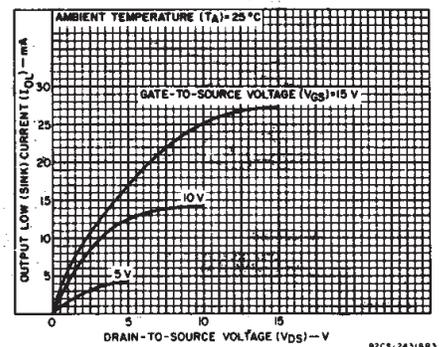


Fig. 2 - Typical output low (sink) current characteristics.

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# CD4099B Types

**RECOMMENDED OPERATING CONDITIONS** at  $T_A = 25^\circ\text{C}$  (Unless otherwise specified)  
 For maximum reliability, nominal operating conditions should be selected so that operation is always within the following ranges.

| CHARACTERISTIC   | SEE FIG. 15* | V <sub>DD</sub> (V) | LIMITS |      | UNITS |
|--|--------------|---------------------|--------|------|-------|
|  |              |                     | MIN.   | MAX. |       |
| Supply Voltage Range:<br>(At $T_A$ = Full Package Temperature Range) |              |                     | 3      | 18   | V     |
| Minimum Pulse Width, $t_W$<br>Data                                   | 4            | 5                   | 200    | —    | ns    |
|  |              | 10                  | 100    | —    |       |
|  |              | 15                  | 80     | —    |       |
| Address  | 8            | 5                   | 400    | —    | ns    |
|  |              | 10                  | 200    | —    |       |
|  |              | 15                  | 125    | —    |       |
| Reset  | 5            | 5                   | 150    | —    | ns    |
|  |              | 10                  | 75     | —    |       |
|  |              | 15                  | 50     | —    |       |
| Setup Time, $t_S$<br>Data to WRITE DISABLE                           | 6            | 5                   | 100    | —    | ns    |
|  |              | 10                  | 50     | —    |       |
|  |              | 15                  | 35     | —    |       |
| Hold Time, $t_H$<br>Data to WRITE DISABLE                            | 7            | 5                   | 150    | —    | ns    |
|  |              | 10                  | 75     | —    |       |
|  |              | 15                  | 50     | —    |       |

\* Circled numbers refer to times indicated on master timing diagram.

Note: In addition to the above characteristics, a WRITE DISABLE ON time (the time that WRITE DISABLE is at a high level) must be observed during an address change for the total time that the external address lines A0, A1, and A2 are settling to a stable level, to prevent a wrong cell from being addressed (see Fig. 3).

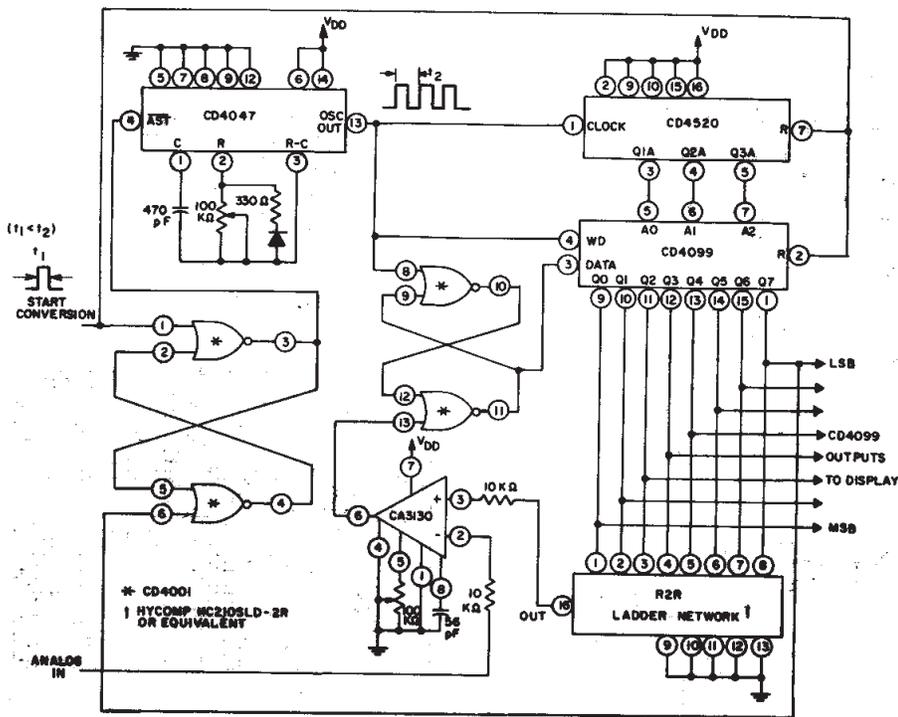


Fig. 5 - A/D converter

92CL-2764

| MODE SELECTION |   |   |                      |
|----------------|---|---|----------------------|
| WD             | R | ADDRESSED LATCH                                       | UNADDRESSED LATCH    |
| 0              | 0 | Follows Data  | Holds Previous State |
| 0              | 1 | Follows Data<br>(Active High 8-Channel Demultiplexer) | Reset to "0"         |
| 1              | 0 | Holds Previous State                                  | Reset to "0"         |
| 1              | 1 | Reset to "0"  | Reset to "0"         |

WD = WRITE DISABLE

R = RESET

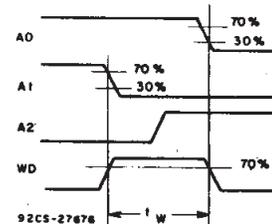


Fig. 3 - Definition of WRITE DISABLE ON time.

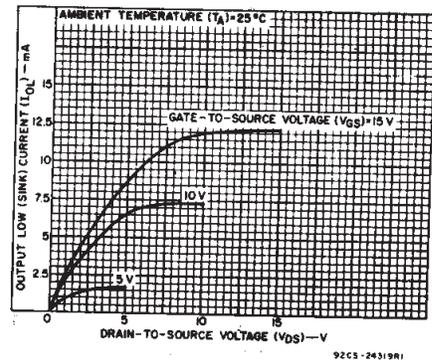


Fig. 4 - Minimum output low (sink) current characteristics.

92CS-24319R1

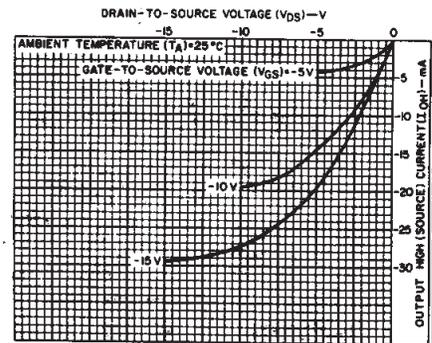


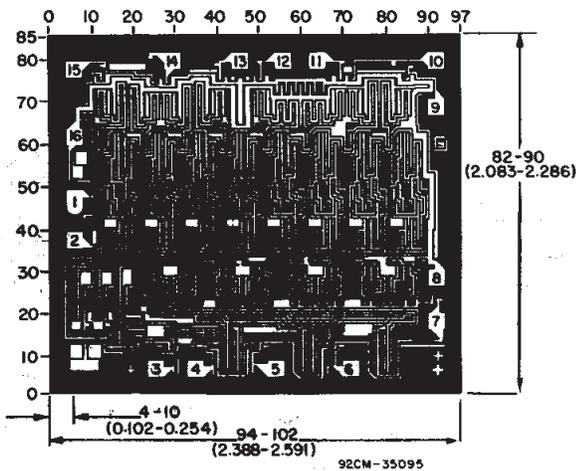
Fig. 6 - Typical output high (source) current characteristics.

92CS-24320R3

# CD4099B Types

## STATIC ELECTRICAL CHARACTERISTICS

| CHARACTERISTIC                                     | CONDITIONS            |                        |                        | LIMITS AT INDICATED TEMPERATURES (°C) |       |       |       |       |                   |      | UNITS |
|--|-----------------------|------------------------|------------------------|---------------------------------------|-------|-------|-------|-------|-------------------|------|-------|
|  | V <sub>O</sub><br>(V) | V <sub>IN</sub><br>(V) | V <sub>DD</sub><br>(V) | -55                                   | -40   | +85   | +125  | +25   |                   |      |       |
|  |                       |                        |                        |                                       |       |       |       | Min.  | Typ.              | Max. |       |
| Quiescent Device Current, I <sub>DD</sub> Max.     | -                     | 0,5                    | 5                      | 5                                     | 5     | 150   | 150   | -     | 0.04              | 5    | μA    |
|  | -                     | 0,10                   | 10                     | 10                                    | 10    | 300   | 300   | -     | 0.04              | 10   |       |
|  | -                     | 0,15                   | 15                     | 20                                    | 20    | 600   | 600   | -     | 0.04              | 20   |       |
|  | -                     | 0,20                   | 20                     | 100                                   | 100   | 3000  | 3000  | -     | 0.08              | 100  |       |
| Output Low (Sink) Current I <sub>OL</sub> Min.     | 0.4                   | 0,5                    | 5                      | 0.64                                  | 0.61  | 0.42  | 0.36  | 0.51  | 1                 | -    | mA    |
|  | 0.5                   | 0,10                   | 10                     | 1.6                                   | 1.5   | 1.1   | 0.9   | 1.3   | 2.6               | -    |       |
|  | 1.5                   | 0,15                   | 15                     | 4.2                                   | 4     | 2.8   | 2.4   | 3.4   | 6.8               | -    |       |
| Output High (Source) Current, I <sub>OH</sub> Min. | 4.6                   | 0,5                    | 5                      | -0.64                                 | -0.61 | -0.42 | -0.36 | -0.51 | -1                | -    | mA    |
|  | 2.5                   | 0,5                    | 5                      | -2                                    | -1.8  | -1.3  | -1.15 | -1.6  | -3.2              | -    |       |
|  | 9.5                   | 0,10                   | 10                     | -1.6                                  | -1.5  | -1.1  | -0.9  | -1.3  | -2.6              | -    |       |
| Output Voltage: Low-Level, V <sub>OL</sub> Max.    | -                     | 0,5                    | 5                      | 0.05                                  |       |       |       | -     | 0                 | 0.05 | V     |
|  | -                     | 0,10                   | 10                     | 0.05                                  |       |       |       | -     | 0                 | 0.05 |       |
|  | -                     | 0,15                   | 15                     | 0.05                                  |       |       |       | -     | 0                 | 0.05 |       |
| Output Voltage: High-Level, V <sub>OH</sub> Min.   | -                     | 0,5                    | 5                      | 4.95                                  |       |       |       | 4.95  | 5                 | -    | V     |
|  | -                     | 0,10                   | 10                     | 9.95                                  |       |       |       | 9.95  | 10                | -    |       |
|  | -                     | 0,15                   | 15                     | 14.95                                 |       |       |       | 14.95 | 15                | -    |       |
| Input Low Voltage, V <sub>IL</sub> Max.            | 0.5, 4.5              | -                      | 5                      | 1.5                                   |       |       |       | -     | -                 | 1.5  | V     |
|  | 1, 9                  | -                      | 10                     | 3                                     |       |       |       | -     | -                 | 3    |       |
|  | 1.5, 13.5             | -                      | 15                     | 4                                     |       |       |       | -     | -                 | 4    |       |
| Input High Voltage, V <sub>IH</sub> Min.           | 0.5, 4.5              | -                      | 5                      | 3.5                                   |       |       |       | 3.5   | -                 | -    | V     |
|  | 1, 9                  | -                      | 10                     | 7                                     |       |       |       | 7     | -                 | -    |       |
|  | 1.5, 13.5             | -                      | 15                     | 11                                    |       |       |       | 11    | -                 | -    |       |
| Input Current I <sub>IN</sub> Max.                 | -                     | 0,18                   | 18                     | ±0.1                                  | ±0.1  | ±1    | ±1    | -     | ±10 <sup>-5</sup> | ±0.1 | μA    |



**CD4099BH**  
**DIMENSIONS AND PAD LAYOUT**

Dimensions in parentheses are in millimeters and are derived from the basic inch dimensions as indicated. Grid graduations are in mils (10<sup>-3</sup> inch).

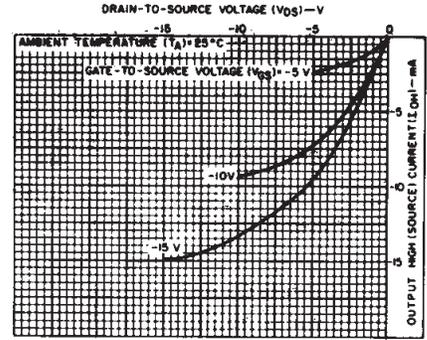


Fig. 7 - Minimum output high (source) current characteristics.

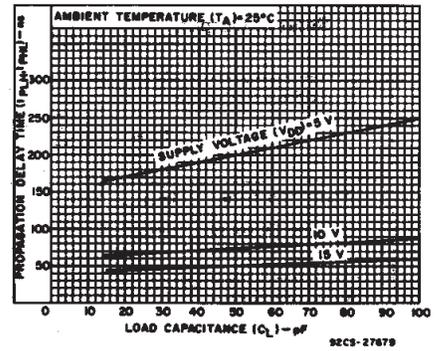


Fig. 8 - Typical propagation delay time (data to Qn) vs. load capacitance.

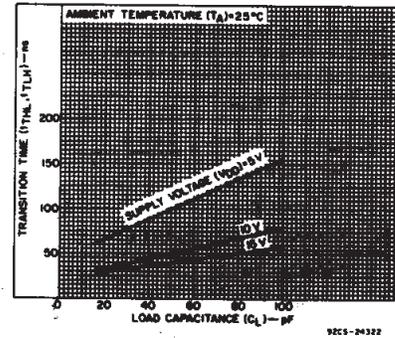


Fig. 9 - Typical transition time vs. load capacitance.

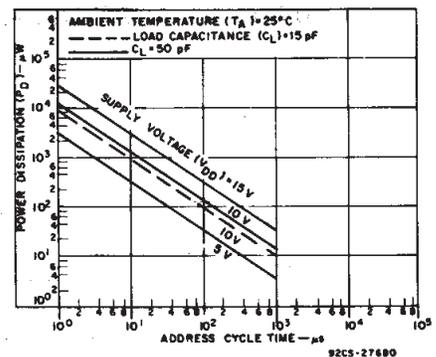


Fig. 10 - Typical dynamic power dissipation vs. address cycle time.

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# CD4099B Types

**DYNAMIC ELECTRICAL CHARACTERISTICS** at  $T_A = 25^\circ\text{C}$ ,  $C_L = 50\text{ pF}$ ,  
 Input  $t_r, t_f = 20\text{ ns}$ ,  $R_L = 200\text{ K}\Omega$

| CHARACTERISTIC  | CONDITIONS |                 | LIMITS            |      | UNITS |
|---|------------|-----------------|-------------------|------|-------|
|   | SEE        | $V_{DD}$<br>(V) | ALL PACKAGE TYPES |      |       |
|   |            |                 | TYP.              | MAX. |       |
| Propagation Delay: $t_{PLH}$ ,<br>$t_{PHL}$                             | ①          | 5               | 200               | 400  | ns    |
|   |            | 10              | 75                | 150  |       |
|   |            | 15              | 50                | 100  |       |
| Data to Output,<br>WRITE DISABLE<br>to Output, $t_{PLH}$ ,<br>$t_{PHL}$ | ②          | 5               | 200               | 400  |       |
|   |            | 10              | 80                | 160  |       |
|   |            | 15              | 60                | 120  |       |
| Reset to Output,<br>$t_{PHL}$   | ③          | 5               | 175               | 350  |       |
|   |            | 10              | 80                | 160  |       |
|   |            | 15              | 65                | 130  |       |
| Address to Output,<br>$t_{PLH}$ ,<br>$t_{PHL}$                          | ⑨          | 5               | 225               | 450  |       |
|   |            | 10              | 100               | 200  |       |
|   |            | 15              | 75                | 150  |       |
| Transition Time,<br>(Any Output) $t_{THL}$ ,<br>$t_{TLH}$               |            | 5               | 100               | 200  | ns    |
|   |            | 10              | 50                | 100  |       |
|   |            | 15              | 40                | 80   |       |
| Minimum Pulse<br>Width, $t_W$<br>Data                                   | ④          | 5               | 100               | 200  | ns    |
|   |            | 10              | 50                | 100  |       |
|   |            | 15              | 40                | 80   |       |
| Address   | ⑧          | 5               | 200               | 400  | ns    |
|   |            | 10              | 100               | 200  |       |
|   |            | 15              | 65                | 125  |       |
| Reset   | ⑤          | 5               | 75                | 150  | ns    |
|   |            | 10              | 40                | 75   |       |
|   |            | 15              | 25                | 50   |       |
| Minimum Setup<br>Time, $t_S$<br>Data to WRITE DISABLE                   | ⑥          | 5               | 50                | 100  | ns    |
|   |            | 10              | 25                | 50   |       |
|   |            | 15              | 20                | 35   |       |
| Minimum Hold<br>Time, $t_H$<br>Data to WRITE DISABLE                    | ⑦          | 5               | 75                | 150  | ns    |
|   |            | 10              | 40                | 75   |       |
|   |            | 15              | 25                | 50   |       |
| Input Capacitance, $C_{IN}$   | Any Input  |                 | 5                 | 7.5  | pF    |

\*Circled numbers refer to times indicated on master timing diagram.

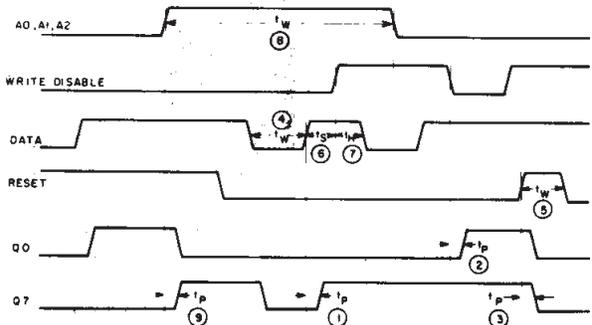


Fig. 15 - Master timing diagram.

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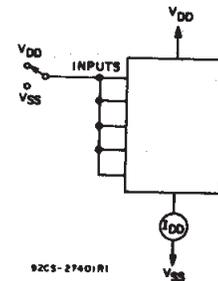


Fig. 11 - Quiescent device current test circuit.

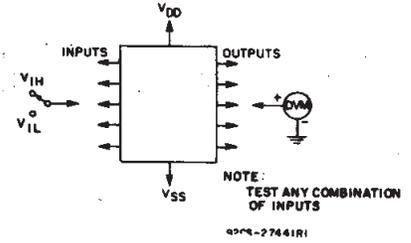


Fig. 12 - Input voltage test circuit.

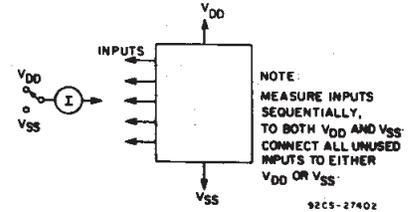


Fig. 13 - Input current test circuit.

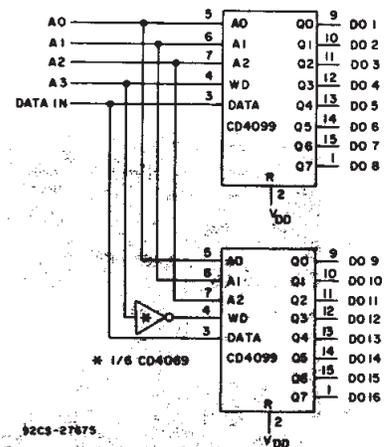


Fig. 14 - 1-of-16 decoder/demultiplexer.

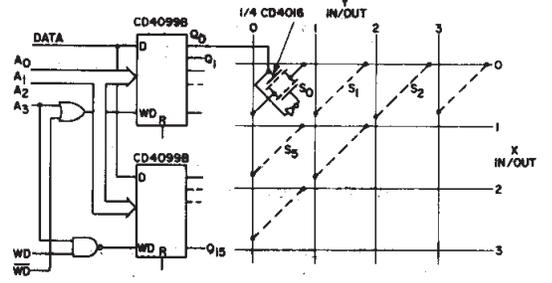


Fig. 16 - Multiple selection decoding - 4 x 4 crosspoint switch.

**PACKAGING INFORMATION**

| Orderable Device | Status<br>(1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan<br>(2)  | Lead finish/<br>Ball material<br>(6) | MSL Peak Temp<br>(3) | Op Temp (°C) | Device Marking<br>(4/5) | Samples                 |
|------------------|---------------|--------------|-----------------|------|-------------|------------------|--------------------------------------|----------------------|--------------|-------------------------|-------------------------|
| CD4099BE         | ACTIVE        | PDIP         | N               | 16   | 25          | RoHS & Green     | NIPDAU                               | N / A for Pkg Type   | -55 to 125   | CD4099BE                | <a href="#">Samples</a> |
| CD4099BF         | ACTIVE        | CDIP         | J               | 16   | 1           | Non-RoHS & Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | CD4099BF                | <a href="#">Samples</a> |
| CD4099BF3A       | ACTIVE        | CDIP         | J               | 16   | 1           | Non-RoHS & Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | CD4099BF3A              | <a href="#">Samples</a> |
| CD4099BM         | ACTIVE        | SOIC         | D               | 16   | 40          | RoHS & Green     | NIPDAU                               | Level-1-260C-UNLIM   | -55 to 125   | CD4099BM                | <a href="#">Samples</a> |
| CD4099BM96       | ACTIVE        | SOIC         | D               | 16   | 2500        | RoHS & Green     | NIPDAU                               | Level-1-260C-UNLIM   | -55 to 125   | CD4099BM                | <a href="#">Samples</a> |
| CD4099BNSR       | ACTIVE        | SO           | NS              | 16   | 2000        | RoHS & Green     | NIPDAU                               | Level-1-260C-UNLIM   | -55 to 125   | CD4099B                 | <a href="#">Samples</a> |
| CD4099BPWR       | ACTIVE        | TSSOP        | PW              | 16   | 2000        | RoHS & Green     | NIPDAU                               | Level-1-260C-UNLIM   | -55 to 125   | CM099B                  | <a href="#">Samples</a> |
| JM38510/17601BEA | ACTIVE        | CDIP         | J               | 16   | 1           | Non-RoHS & Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | JM38510/<br>17601BEA    | <a href="#">Samples</a> |
| M38510/17601BEA  | ACTIVE        | CDIP         | J               | 16   | 1           | Non-RoHS & Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | JM38510/<br>17601BEA    | <a href="#">Samples</a> |

(1) The marketing status values are defined as follows:

**ACTIVE:** Product device recommended for new designs.

**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.

**OBSOLETE:** TI has discontinued the production of the device.

(2) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

**RoHS Exempt:** TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

**Green:** TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

<sup>(5)</sup> Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

<sup>(6)</sup> Lead finish/Ball material - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

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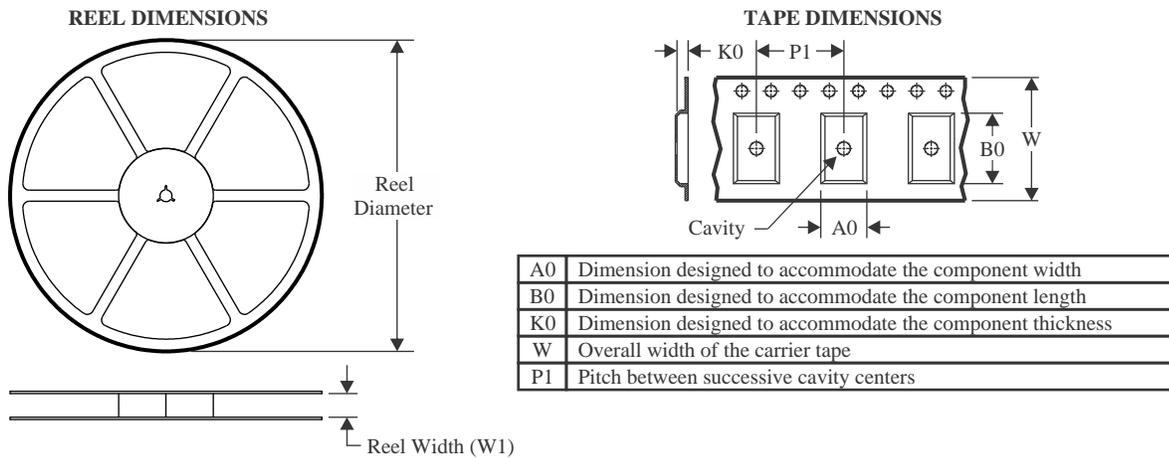
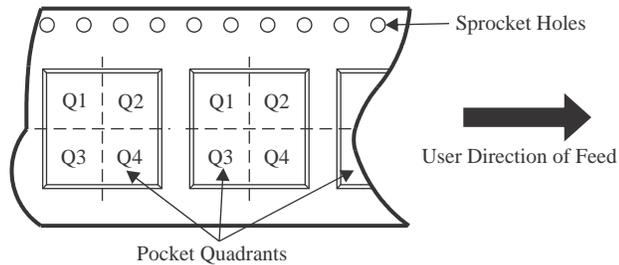
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**OTHER QUALIFIED VERSIONS OF CD4099B, CD4099B-MIL :**

- Catalog : [CD4099B](#)
- Military : [CD4099B-MIL](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
- Military - QML certified for Military and Defense Applications

**TAPE AND REEL INFORMATION**

**QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE**


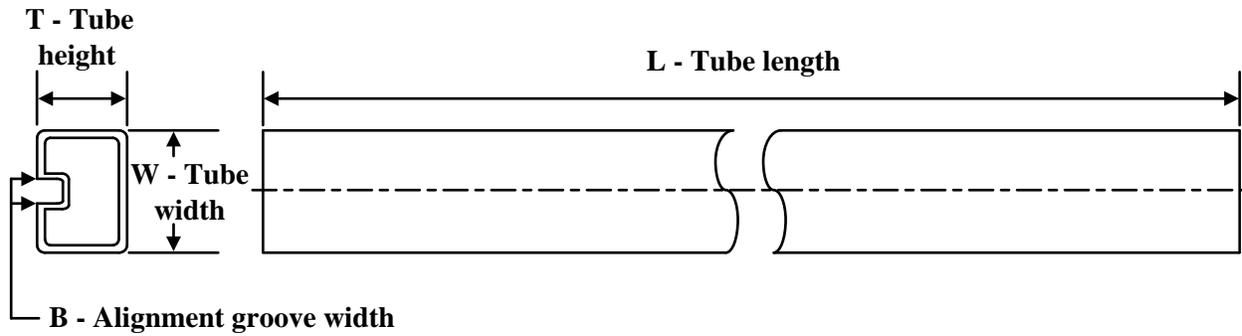
\*All dimensions are nominal

| Device     | Package Type | Package Drawing | Pins | SPQ  | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| CD4099BM96 | SOIC         | D               | 16   | 2500 | 330.0              | 16.4               | 6.5     | 10.3    | 2.1     | 8.0     | 16.0   | Q1            |
| CD4099BNSR | SO           | NS              | 16   | 2000 | 330.0              | 16.4               | 8.2     | 10.5    | 2.5     | 12.0    | 16.0   | Q1            |
| CD4099BPWR | TSSOP        | PW              | 16   | 2000 | 330.0              | 12.4               | 6.9     | 5.6     | 1.6     | 8.0     | 12.0   | Q1            |

**TAPE AND REEL BOX DIMENSIONS**


\*All dimensions are nominal

| Device     | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|------------|--------------|-----------------|------|------|-------------|------------|-------------|
| CD4099BM96 | SOIC         | D               | 16   | 2500 | 340.5       | 336.1      | 32.0        |
| CD4099BNSR | SO           | NS              | 16   | 2000 | 356.0       | 356.0      | 35.0        |
| CD4099BPWR | TSSOP        | PW              | 16   | 2000 | 356.0       | 356.0      | 35.0        |

**TUBE**


\*All dimensions are nominal

| Device   | Package Name | Package Type | Pins | SPQ | L (mm) | W (mm) | T (μm) | B (mm) |
|----------|--------------|--------------|------|-----|--------|--------|--------|--------|
| CD4099BE | N            | PDIP         | 16   | 25  | 506    | 13.97  | 11230  | 4.32   |
| CD4099BE | N            | PDIP         | 16   | 25  | 506    | 13.97  | 11230  | 4.32   |
| CD4099BM | D            | SOIC         | 16   | 40  | 507    | 8      | 3940   | 4.32   |

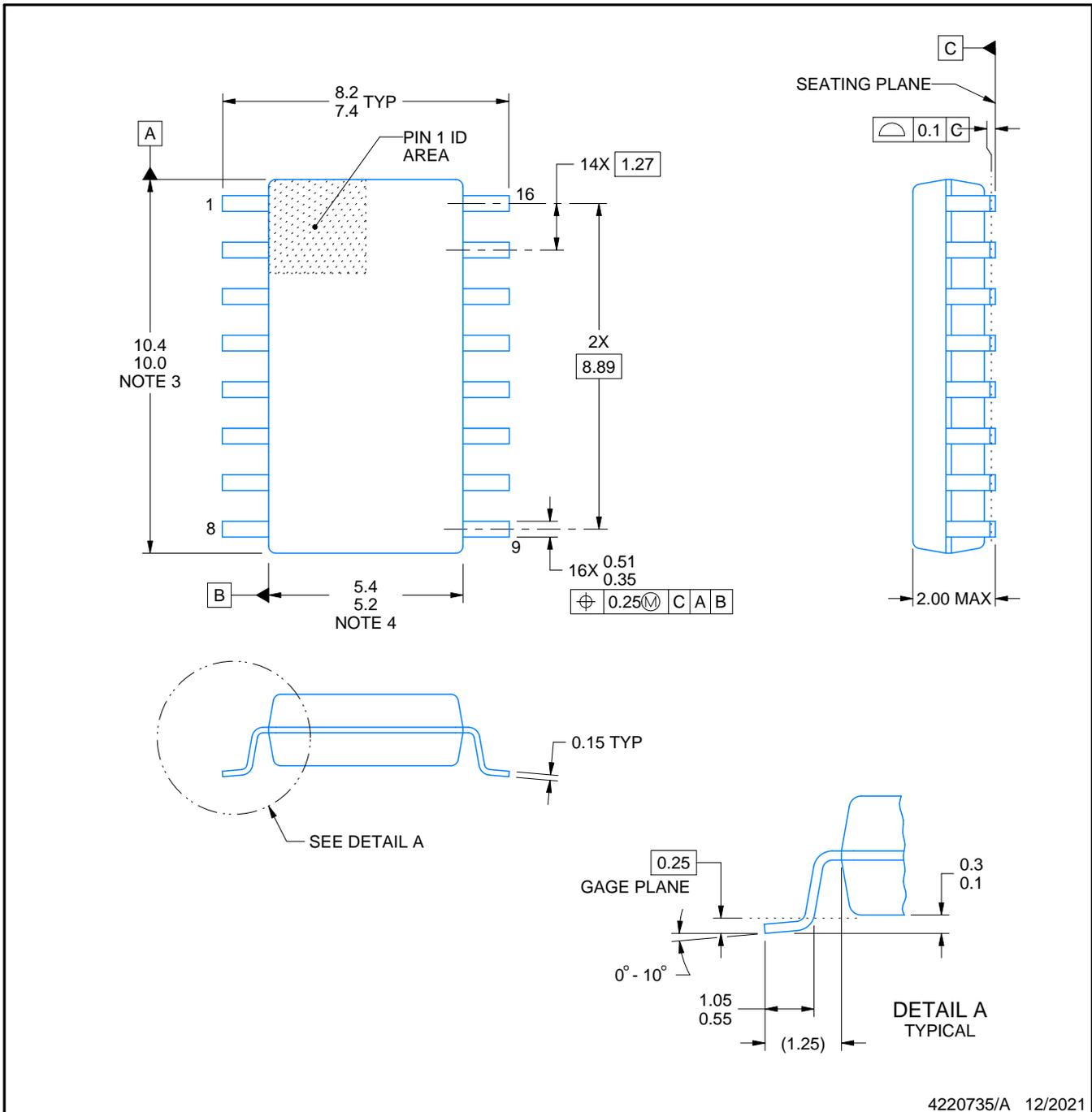


# PACKAGE OUTLINE

## NS0016A

### SOP - 2.00 mm max height

SOP



4220735/A 12/2021

#### NOTES:

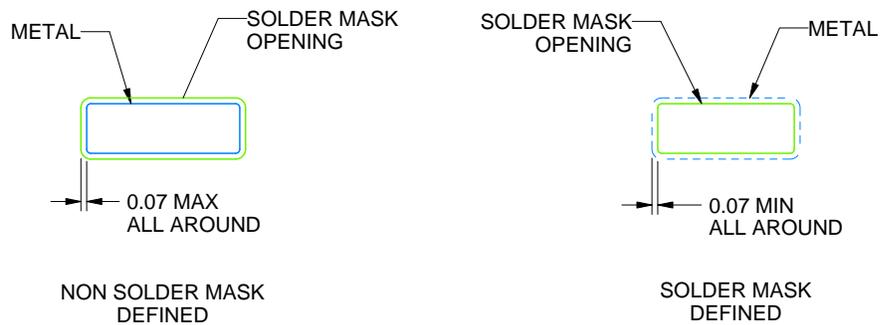
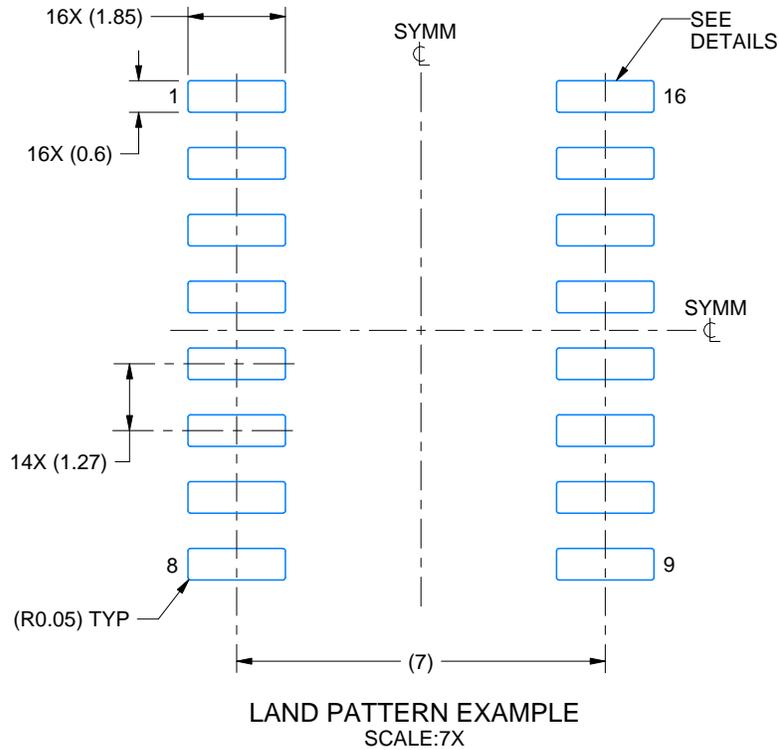
1. All linear dimensions are in millimeters. Dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm, per side.
4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm, per side.

# EXAMPLE BOARD LAYOUT

NS0016A

SOP - 2.00 mm max height

SOP



SOLDER MASK DETAILS

4220735/A 12/2021

NOTES: (continued)

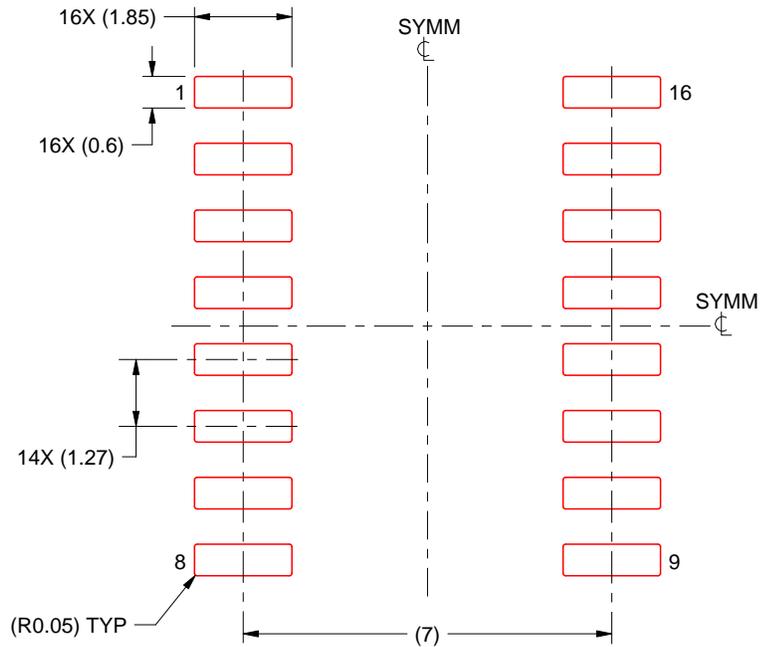
- 5. Publication IPC-7351 may have alternate designs.
- 6. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

# EXAMPLE STENCIL DESIGN

NS0016A

SOP - 2.00 mm max height

SOP



SOLDER PASTE EXAMPLE  
BASED ON 0.125 mm THICK STENCIL  
SCALE:7X

4220735/A 12/2021

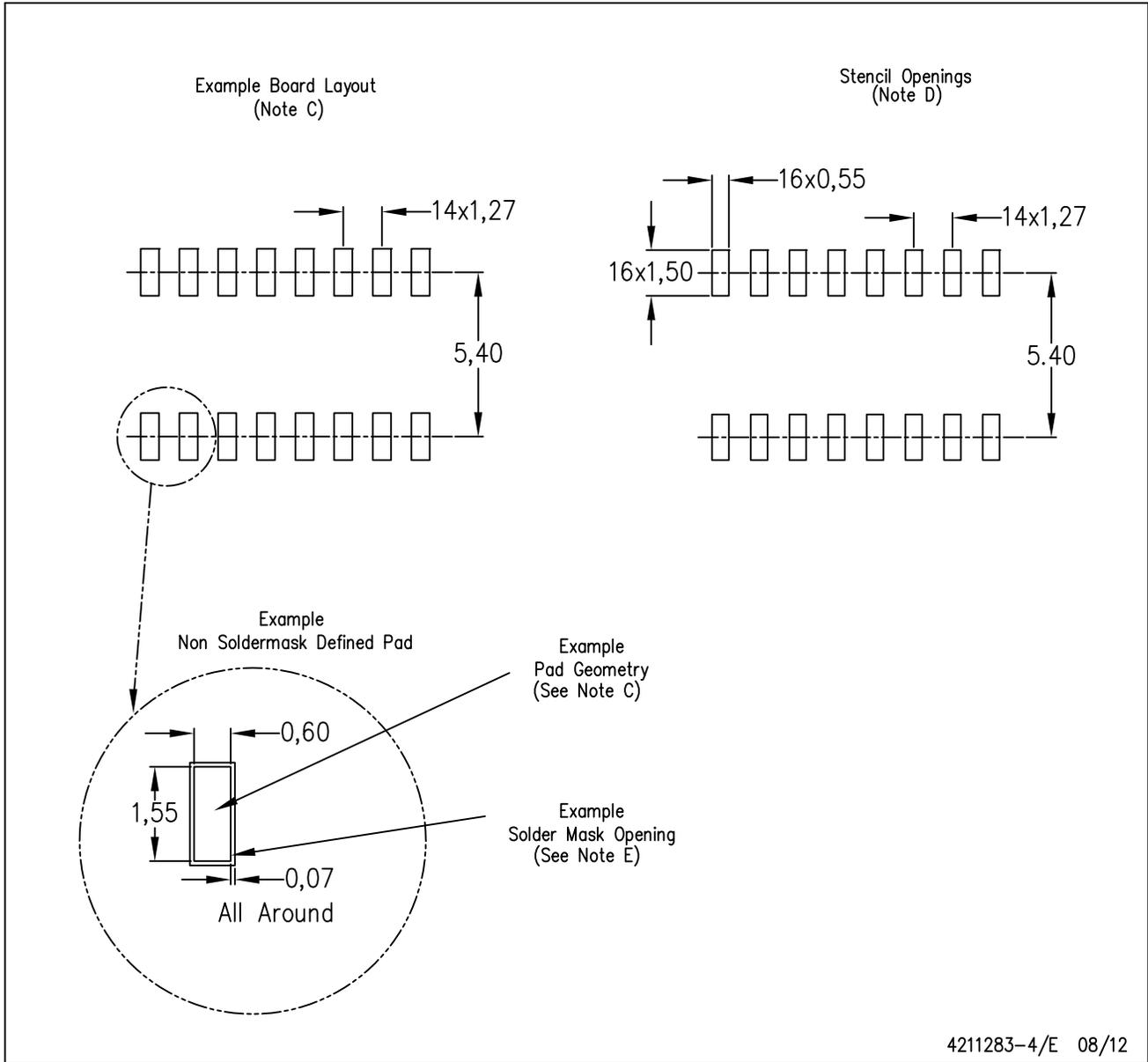
NOTES: (continued)

7. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
8. Board assembly site may have different recommendations for stencil design.

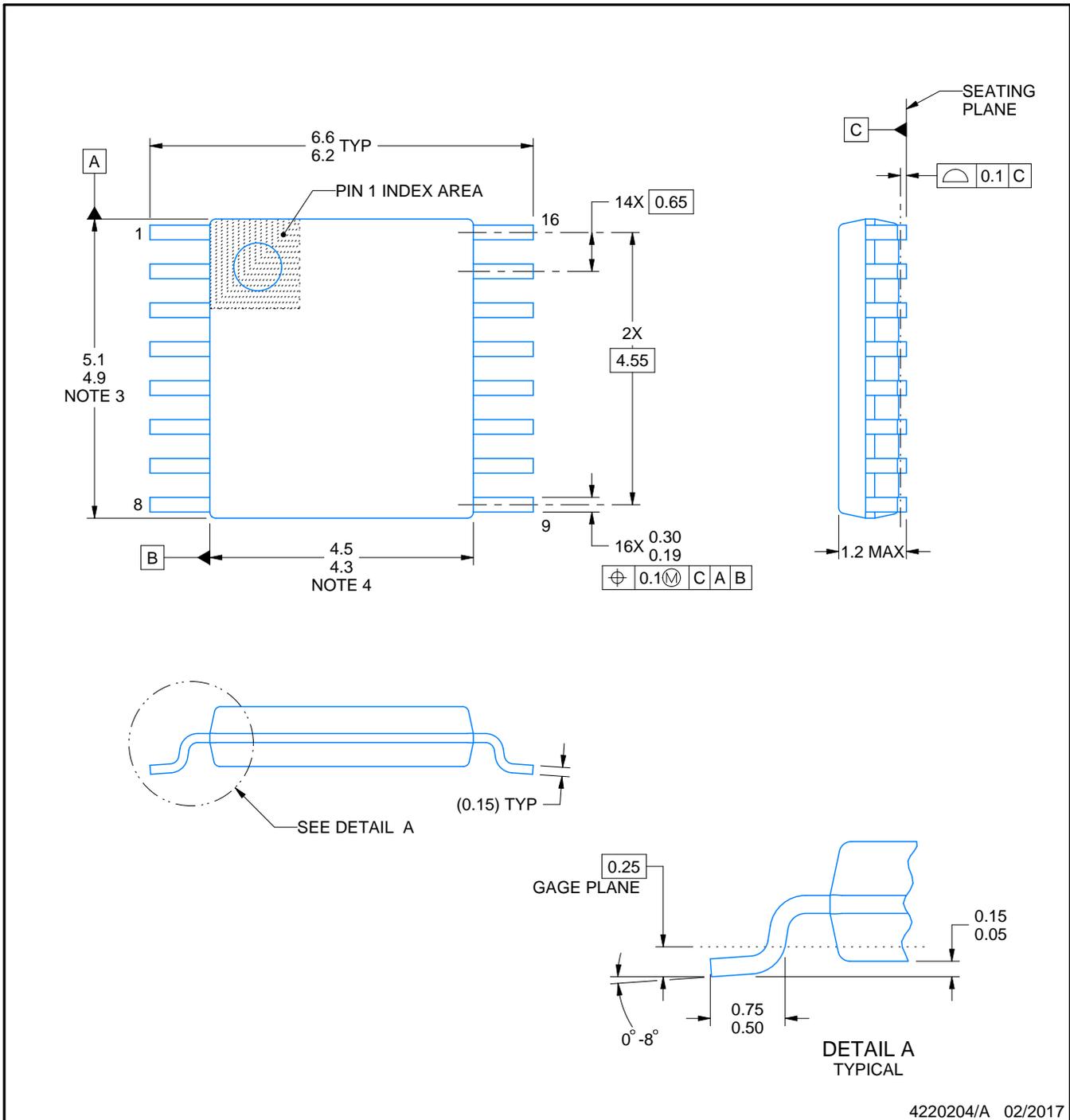


D (R-PDSO-G16)

PLASTIC SMALL OUTLINE



- NOTES:
- All linear dimensions are in millimeters.
  - This drawing is subject to change without notice.
  - Publication IPC-7351 is recommended for alternate designs.
  - Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
  - Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.



4220204/A 02/2017

NOTES:

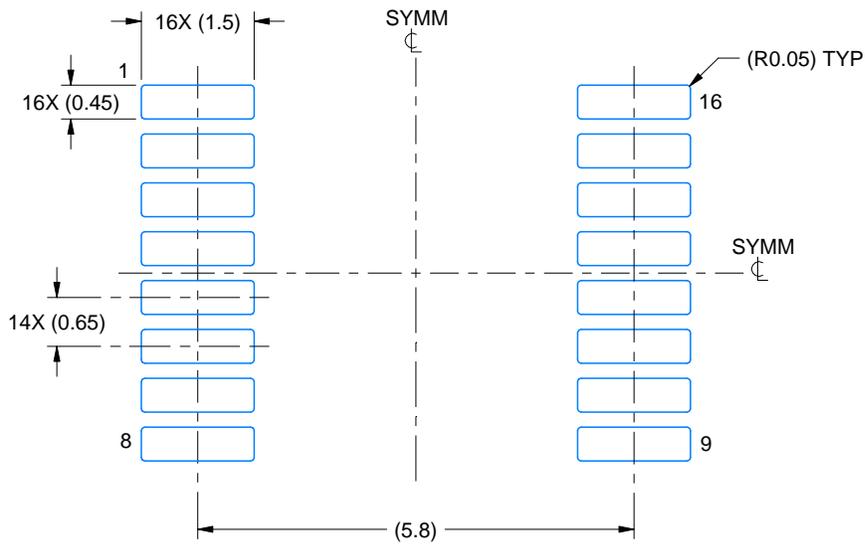
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm per side.
4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm per side.
5. Reference JEDEC registration MO-153.

# EXAMPLE BOARD LAYOUT

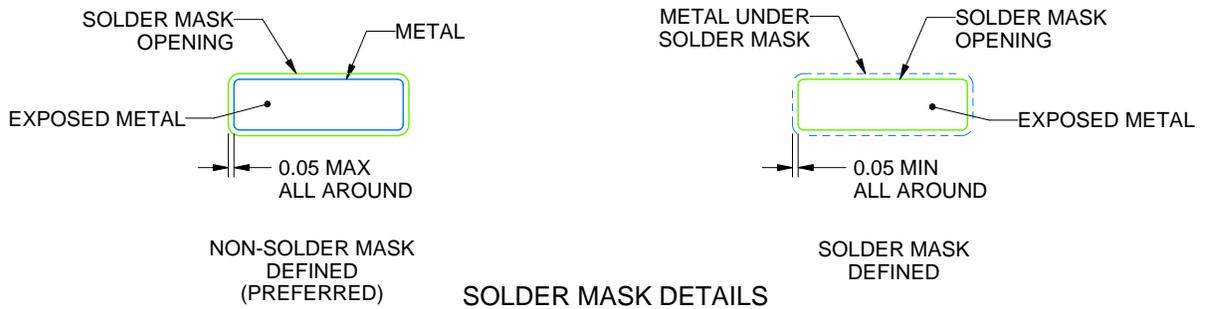
PW0016A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE: 10X



SOLDER MASK DETAILS

4220204/A 02/2017

NOTES: (continued)

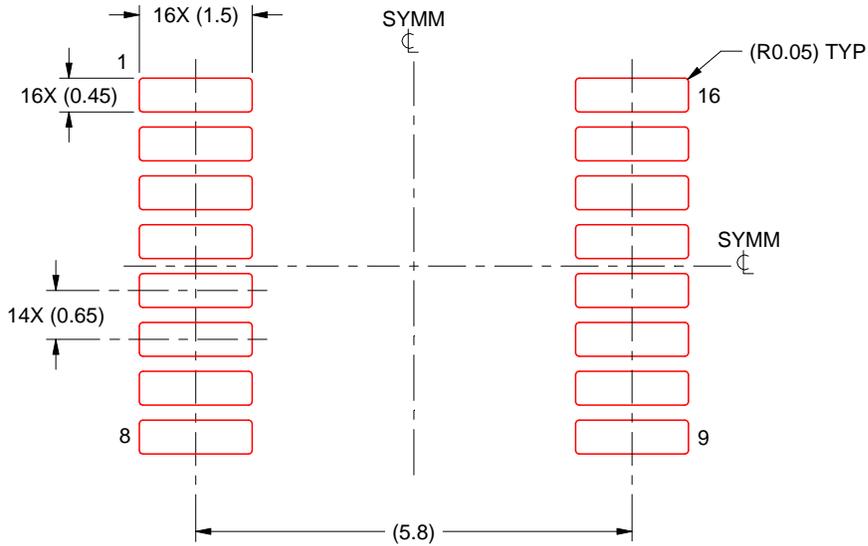
- 6. Publication IPC-7351 may have alternate designs.
- 7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

# EXAMPLE STENCIL DESIGN

PW0016A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



SOLDER PASTE EXAMPLE  
BASED ON 0.125 mm THICK STENCIL  
SCALE: 10X

4220204/A 02/2017

NOTES: (continued)

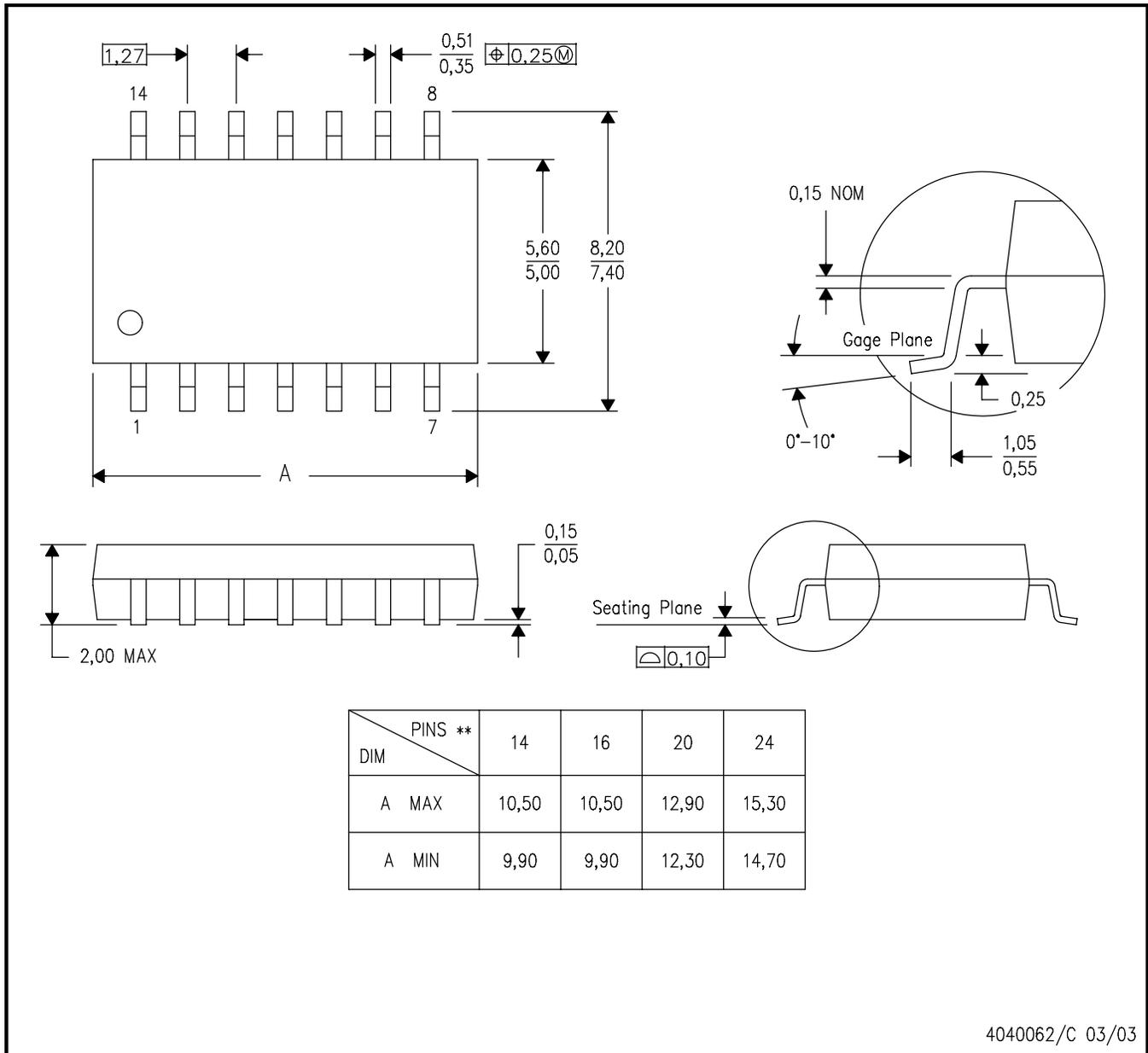
8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

# MECHANICAL DATA

NS (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN



- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.

N (R-PDIP-T\*\*)

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN

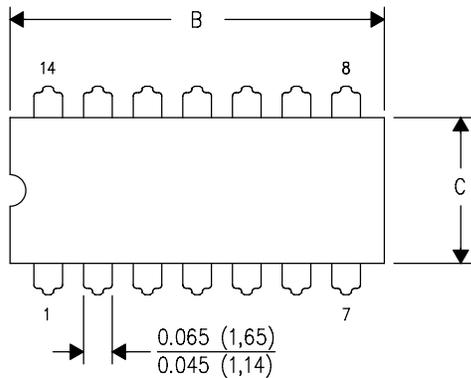


- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - (C) Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
  - (D) The 20 pin end lead shoulder width is a vendor option, either half or full width.

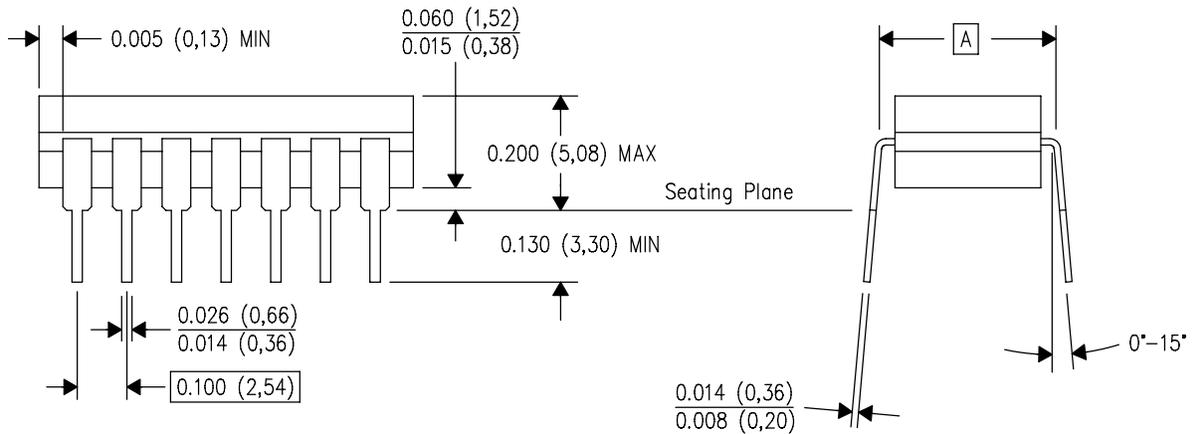
J (R-GDIP-T\*\*)

14 LEADS SHOWN

CERAMIC DUAL IN-LINE PACKAGE



| DIM \ PINS ** | 14                     | 16                     | 18                     | 20                     |
|---------------|------------------------|------------------------|------------------------|------------------------|
| A             | 0.300<br>(7,62)<br>BSC | 0.300<br>(7,62)<br>BSC | 0.300<br>(7,62)<br>BSC | 0.300<br>(7,62)<br>BSC |
| B MAX         | 0.785<br>(19,94)       | .840<br>(21,34)        | 0.960<br>(24,38)       | 1.060<br>(26,92)       |
| B MIN         | —                      | —                      | —                      | —                      |
| C MAX         | 0.300<br>(7,62)        | 0.300<br>(7,62)        | 0.310<br>(7,87)        | 0.300<br>(7,62)        |
| C MIN         | 0.245<br>(6,22)        | 0.245<br>(6,22)        | 0.220<br>(5,59)        | 0.245<br>(6,22)        |



4040083/F 03/03

- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. This package is hermetically sealed with a ceramic lid using glass frit.
  - D. Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
  - E. Falls within MIL STD 1835 GDIP1-T14, GDIP1-T16, GDIP1-T18 and GDIP1-T20.

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